

CLAIMS

What is claimed is:

- 1 1. A diode laser assembly, comprising:
2 a substrate;
3 an epitaxial structure formed on the substrate;
4 a laser formed in the epitaxial structure; and
5 an amplifier formed in the epitaxial structure, at least a portion of the laser and
6 amplifier sharing a common waveguide.
- 1 2. The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform optical properties along its centerline.
- 1 3 The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform cross-sectional area along its centerline.
- 1 4. The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform curvature along its centerline.
- 1 5. The laser assembly of claim 1 wherein the common waveguide has non-
2 uniform optical properties normal to its centerline.
- 1 6. The assembly of claim 1, wherein the amplifier includes at least one active
2 region and at least one passive region.
- 1 7. The assembly of claim 6, wherein the waveguide extends through an active
2 region and a passive region.
- 1 8. The assembly of claim 7, wherein a portion of the waveguide in the
2 amplifier is curved.
- 1 9. The assembly of claim 7, wherein at least a portion of the waveguide in a
2 passive region of the amplifier is curved.
- 1 10. The assembly of claim 7, wherein a portion of the waveguide in the
2 amplifier is curved and the amplifier includes a flared waveguide section.

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1 11. The assembly of claim 7, wherein an interface between the active region
2 and the passive region is oblique to a centerline of the waveguide.

1 12. The assembly of claim 7, wherein an interface between the active region
2 and the passive region is substantially normal to a centerline of the waveguide.

1 13. The assembly of claim 7, wherein an end of the waveguide in the amplifier
2 terminates at an oblique angle to an output facet.

1 14. The assembly of claim 6, wherein the waveguide includes a waveguide
2 mode adapter.

1 15. The assembly of claim 1, wherein at least a portion of the waveguide is
2 flared.

1 16. The assembly of claim 23, wherein a flared portion of the waveguide is in
2 an active region.

1 17. The assembly of claim 23, wherein a flared portion of the waveguide is in a
2 passive region.

1 18. The assembly of claim 1, wherein the waveguide includes an active section.

1 19. The assembly of claim 18, wherein the active section of the waveguide is
2 positioned in the first active section of the amplifier.

1 20. The assembly of claim 18, wherein the active section of the waveguide is
2 positioned in the second active section of the amplifier.

1 21. The assembly of claim 6, wherein the first active region has a oblique distal
2 face.

1 22. The assembly of claim 1, wherein the amplifier includes a plurality of
2 independently controllable active regions.

1 23. The assembly of claim 22, wherein a first and a second active region are
2 separated by a passive region.

1 36. The assembly of claim 32, wherein each of the first and second reflectors is
2 a distributed Bragg reflector.

1 37. The assembly of claim 32, wherein a maximum reflectivity of at least one
2 of the first and second reflectors is tunable.

1 38. The assembly of claim 32, wherein a maximum reflectivity of each of the
2 first and second reflectors is tunable.

1 39. The assembly of claim 32, wherein the maximum reflectivities of each of
2 the first and second reflectors are tunable relative to each other.

1 40. The assembly of claim 1, wherein the laser has a multi-active region gain
2 medium.

1 41. The assembly of claim 32, wherein the laser includes a controllable
2 amplifier positioned outside of the laser.

1 42. The assembly of claim 32, wherein the laser includes a controllable
2 attenuator positioned outside of the laser.

1 43. The assembly of claim 32, wherein the laser includes an attenuator and at
2 least one amplifier positioned outside of the laser.

1 44. A diode laser assembly, comprising:
2 a first semiconductor layer in an epitaxial structure;
3 a second semiconductor layer formed in the epitaxial structure, the first and second
4 semiconductor layers having different dopings;
5 a waveguide layer formed between the first and second semiconductor layers, the
6 first waveguide layer including a waveguide, a first reflector and a second reflector;
7 an optically active medium disposed between the first and second reflectors, the first
8 and second reflectors defining a laser cavity; and
9 an amplifier formed in the epitaxial structure, wherein the laser cavity and the
10 amplifier are optically aligned.

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1 45. The assembly of claim 44, wherein the amplifier includes a first active
2 region and a passive region.

1 46. The assembly of claim 45, wherein the waveguide extends through at least
2 a portion of the amplifier.

1 47. The assembly of claim 66, wherein the waveguide extends through the first
2 active region and the passive region.

1 48. The assembly of claim 57, wherein a distal portion of the waveguide in the
2 amplifier is curved.

1 49. The assembly of claim 57, wherein a distal end of the waveguide in the
2 amplifier terminates at an oblique angle to an output facet.

1 50. The assembly of claim 66, wherein the waveguide includes a mode adapter.

1 51. The assembly of claim 44, wherein at least a portion of the waveguide is
2 flared.

1 52. The assembly of claim 44, wherein the waveguide includes an active
2 section.

1 53. The assembly of claim 52, wherein the active section of the waveguide is
2 positioned in the first active section of the amplifier.

1 54. The assembly of claim 52, wherein the active section of the waveguide is
2 positioned in the second active section of the amplifier.

1 55. The assembly of claim 45, wherein the first active region has an oblique
2 distal face.

1 56. The assembly of claim 45, wherein the amplifier includes a second active
2 region.

1 57. The assembly of claim 66, wherein the first and second active regions are
2 separated by a passive region.

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- 1 58. The assembly of claim 57, wherein the first active region has an oblique
2 distal face.
- 1 59. The assembly of claim 58, wherein the second active region has an oblique
2 proximal face.
- 1 60. The assembly of claim 59, wherein the oblique distal face of the first active
2 region is parallel to the oblique proximal face of the second active region.
- 1 61. The assembly of claim 59, wherein the second active region has an oblique
2 distal face.
- 1 62. The assembly of claim 61, wherein the proximal face and the distal face of
2 the second region are parallel.
- 1 63. The assembly of claim 44, wherein the epitaxial structure has areas of
2 differing optical properties.
- 1 64. The assembly of claim 44, wherein the laser includes a mode selection
2 element.
- 1 65. The assembly of claim 64, wherein the mode selection element is a
2 controllable phase shifting element.
- 1 66. The assembly of claim 44, wherein at least one of the first and second
2 reflectors is tunable.
- 1 67. The assembly of claim 66, wherein at least one of the first and second
2 reflectors is a distributed reflector.
- 1 68. The assembly of claim 66, wherein both of the first and second reflectors is
2 a distributed reflector.
- 1 69. The assembly of claim 66, wherein at least one of the first and second
2 reflectors is a distributed Bragg reflector.
- 1 70. The assembly of claim 66, wherein each of the first and second reflectors is
2 a distributed Bragg reflector.

1 71. The assembly of claim 66, wherein a maximum reflectivity of at least one
2 of the first and second reflectors is tunable.

1 72. The assembly of claim 66, wherein a maximum reflectivity of each of the
2 first and second reflectors is tunable.

1 73. The assembly of claim 66, wherein the maximum reflectivities of each of
2 the first and second reflectors are tunable relative to each other.

1 74. The assembly of claim 66, wherein the laser includes a controllable
2 amplifier positioned outside of the laser.

1 75. The assembly of claim 66, wherein the laser includes a controllable
2 attenuator positioned outside of the laser.

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- 1 76. The assembly of claim 66, wherein the laser includes an attenuator and at
2 least one amplifier positioned outside of the resonant cavity.

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